S-E-C-R-E-T

4 of 4
Copy

A&A Report No. 223

SELECTIVE CALLING SYSTEM

25X1

Project # 2110

25X1

SUBMITTED BY

APPROVED BY:

DATE: 24 September 1959

S-E-C-R-E-T

S-E-C-R-E-T

A&A Report No. 223

SELECTIVE CALLING SYSTEM

[redacted]

25X1

Project # 2110

S-E-C-R-E-T

1. INTRODUCTION

Under a radio circuit study program, [redacted] developed a selective calling encoder and a decoder to operate in conjunction with a radio transmitter and a communications receiver. The units were fabricated as test vehicles to demonstrate the feasibility of a highly miniaturized selective calling system using transistors, diodes, and magnetic circuit techniques. 25X1 25X1

The encoder and decoder were subjected to an examination in an effort to determine their suitability as selective calling devices. This report presents discussion and comments in regard to this examination.

2. THEORY OF OPERATION

Briefly, the selective calling system alerts a particular radio receiving position by sounding an audible alarm in response to a coded group of on-off bits of RF signal radiated from a radio transmitter. The on-off bits of signal are generated by an encoder unit which in turn keys a transmitter. In order to transmit a call, the transmitter is keyed according to a code pre-set on the code selection panel of the encoder. The code selection is accomplished by setting ten toggle switches to positions which conform with the code required to call a particular receiver position. When the code group is received, it is compared, bit by bit, with a code generated by a magnetic ring counter in the decoder. If both codes appear to be the same, a signal is passed to an alarm circuit. Any difference will cause the message code to be rejected and the alarm circuit will not be allowed to function.

3. OPERATIONAL PROBLEMS - ENCODER

The encoder of the system was constructed as an item of laboratory equipment with which to check the operation of the decoder. The decoder was of primary interest in the radio circuit study. Initially, the encoder was faulty in its operation as was evident by garbled output. To correct this malfunction, two operating conditions had to be

met. First, the chassis cover was removed so that forced air could be circulated over the components to stabilize the circuits. The room temperature was 75°F. Secondly, electrical isolation was provided between the output keying jacks and the keyed transmitter. This was achieved by using the electrical output to key a relay which in turn keyed an RT-6 transmitter. After these conditions were met, the unit appeared to function in a satisfactory manner with the exception of minor difficulties with the printed board plug-in connectors.

4. OPERATIONAL PROBLEMS - DECODER

The decoder was found to be operating improperly during most of the examination. Initially, this was evident by erratic recognition of a code different from that noted by the designer. The erratic condition was corrected by changing the clock repetition to a slower rate. In order to do this, additional resistance was needed in series with the existing adjusting resistor which was found setting near its high resistance limit. The recognition code for which this unit was designed was noted as 1101000110. The code which it actually recognized was found to be 1001011100. An analysis of the decoder circuitry appeared to indicate that the actual code recognized was correct. This presented some discrepancy in the code setup at the encoder and in the utilization of the transmitted bits in the decoder. For simplification of code bit sequence, the actual code group was inverted by altering three wire connections in the decoder. The code now (0110100011) has the appearance of that which the designer noted with the exception of the first and last bits.

5. CODE SEQUENCE

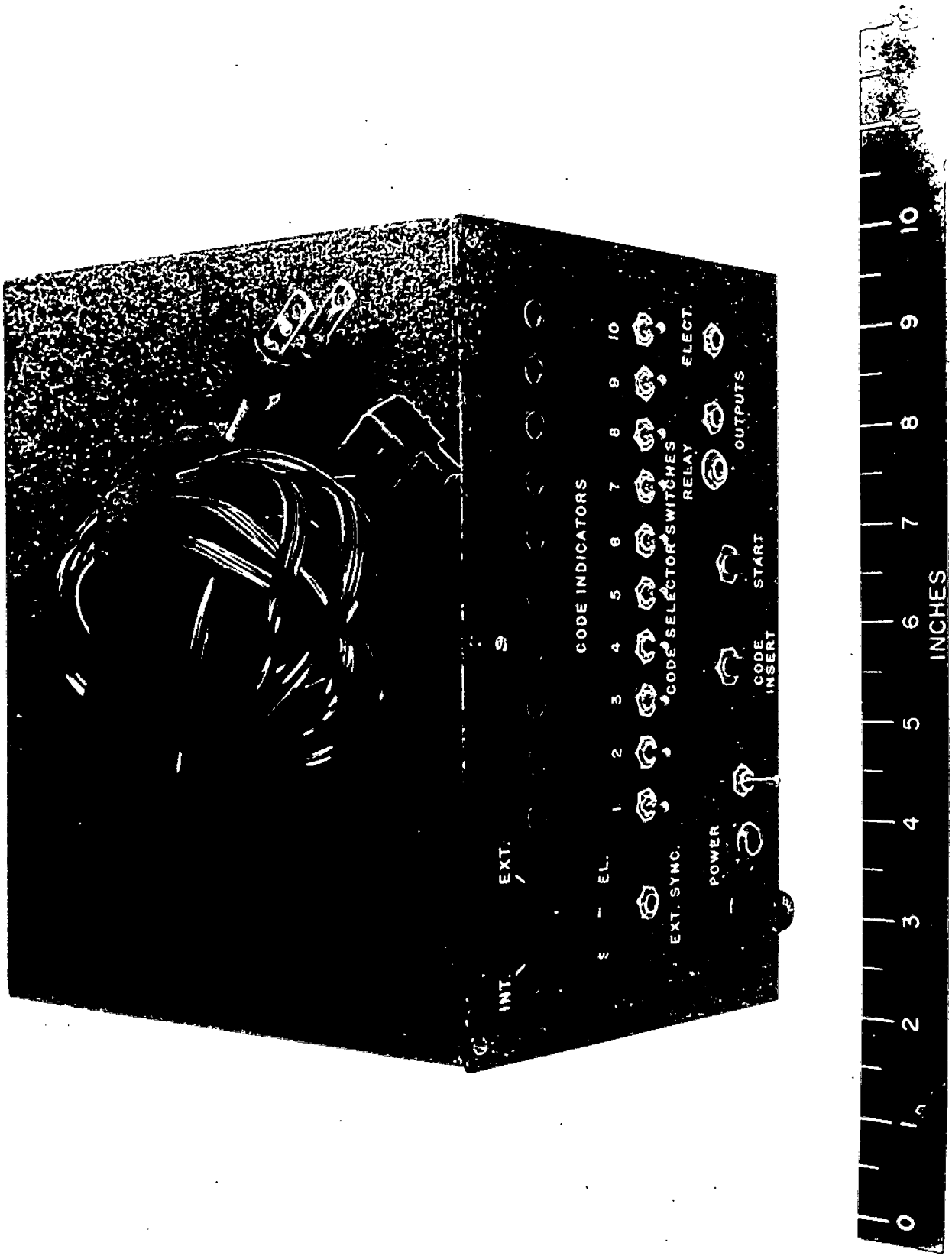
The decoder receives a twelve bit message group and uses the bits as follows. The first bit, or pulse, is used to start the magnetic scanning clock or in other words it serves as a sync pulse. The next ten bits consist of pulse and non-pulse bits which form the code needed for recognition at the error switch gate. The circuit analysis of this decoder appears to indicate that the first bit of the ten bits has no function except to provide delay preceeding the following nine. During this delay the closing circuit core is being reset and the first code sampling core is set as a result of the first scanning pulse. The twelth bit, or pulse, is the last bit and is used for recognition at the alarm switch gate. The stop pulse is generated in a sample winding as a result of the last scanning pulse.

Analyzing the functions of the code bits as indicated in the above paragraph, the decoder appeared to operate in a satisfactory manner under laboratory test conditions. Soon after satisfactory operation was established a transistor failed. A replacement failed to return the unit to normal operating condition. At this stage of the examination, the wiring had become frail and broken. It was felt that no more time was warranted for its repair and as a result the examination was terminated.

6. CONCLUSIONS

Both the encoder and the decoder in their present stage of development are obviously unreliable. The shortcomings are felt to be due to design deficiencies rather than the techniques employed. The circuits are heat sensitive, and the printed board connectors are intermittent. Although no real satisfactory operation was experienced, the tests did indicate that a selective calling system using digital techniques was feasible. Points in question are: (1) Why was it necessary to change wiring connections in order to arrive at the code polarity which was noted by the designer, and (2) Why was there a discrepancy in the purpose of the second transmitted code bit?

Photographs showing the over-all view of each of the two units are attached.



ENCODER

FIGURE 1

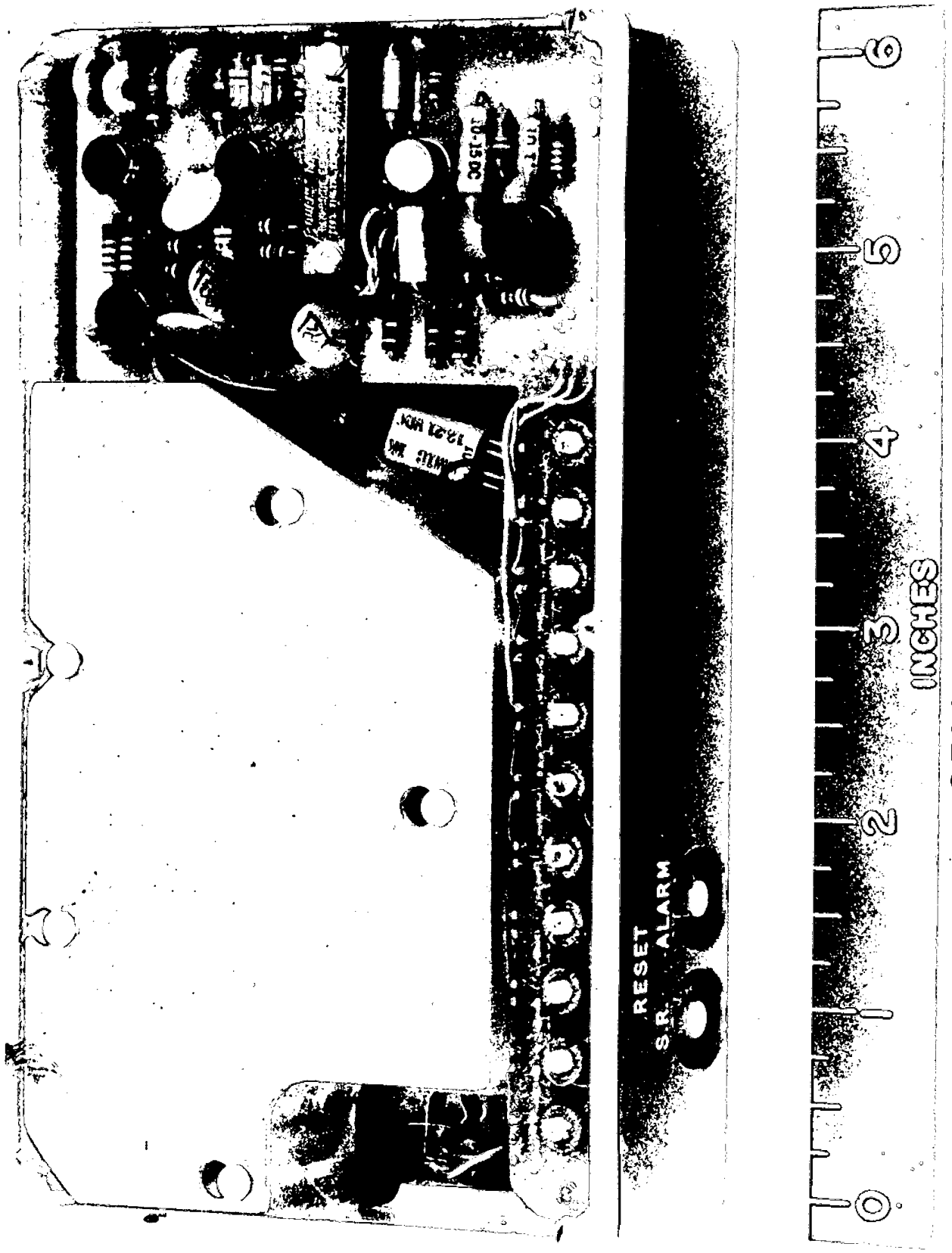
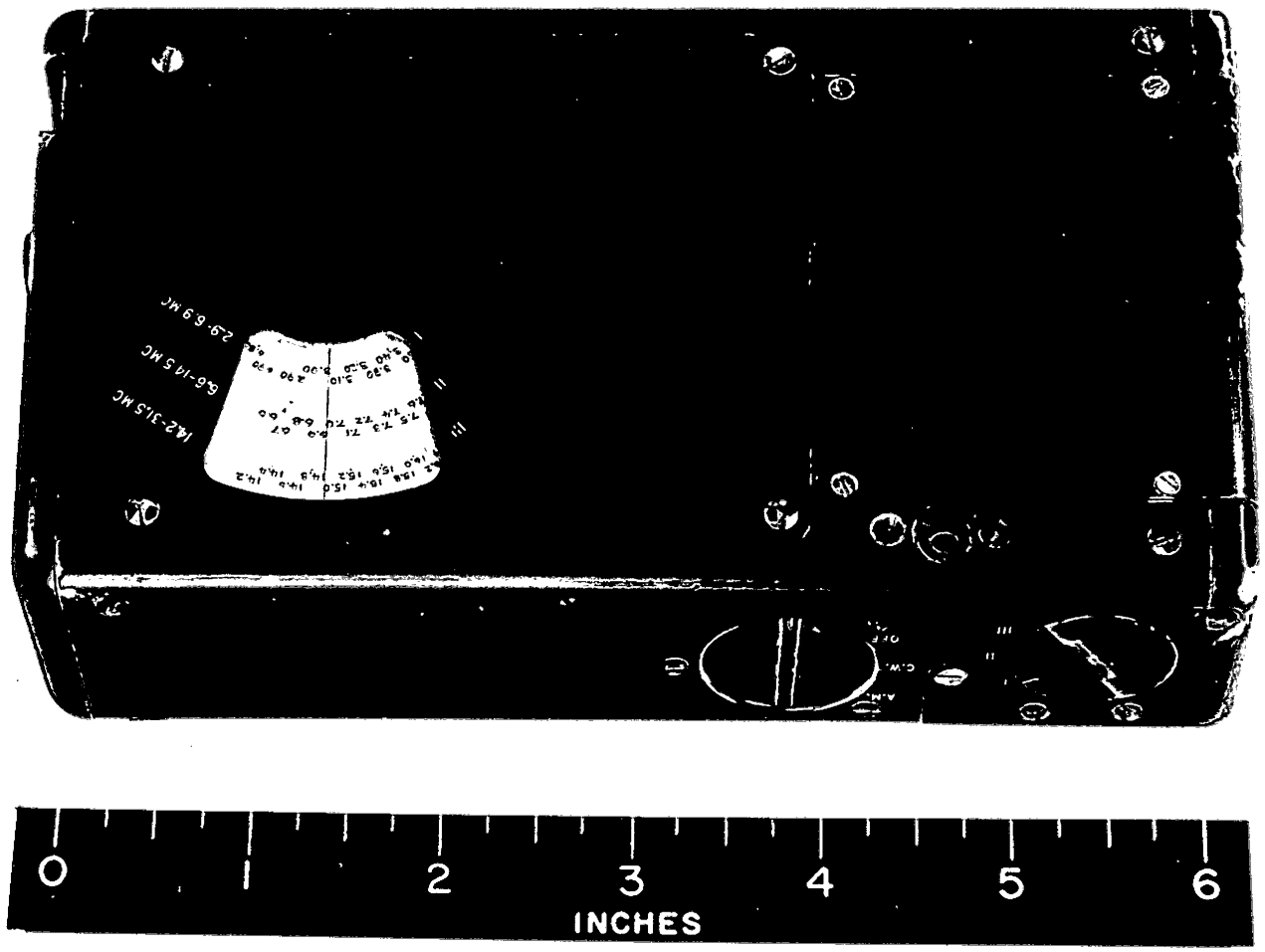
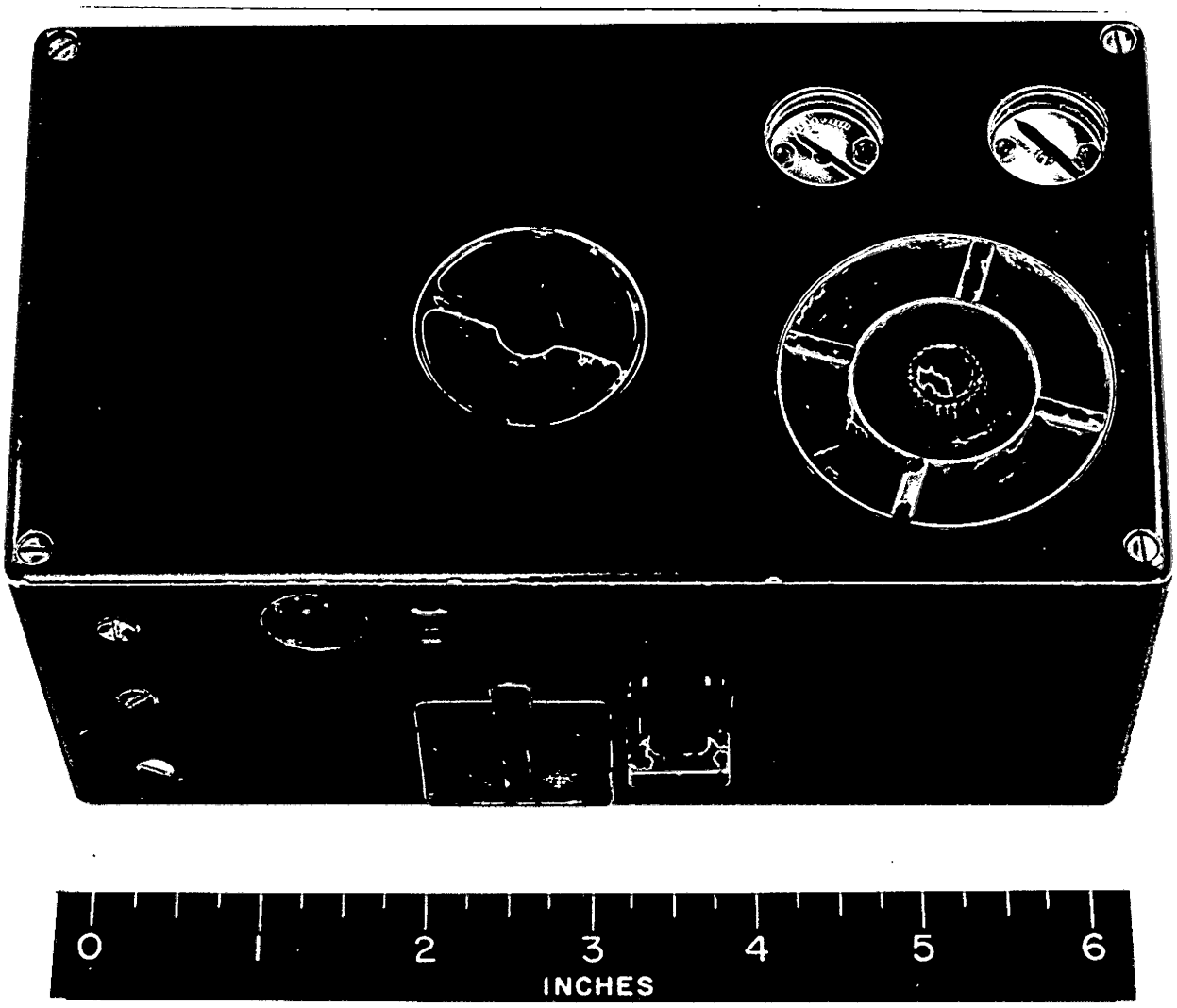


FIGURE 2





Declassified in Part - Sanitized Copy Approved for Release 2012/08/14 : CIA-RDP78-03535A001800060003-2